JOURNAL OF ENDOUROLOGY
Volume 20, Number 5, May 2006
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Use of Surgicel for Sealing Nephrostomy Tract after Totally Tubeless Percutaneous Nephrolithotomy

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ABSTRACT

***Background and Purpose*: Fibrin glue and gelatin matrix have been used to seal nephrostomy tracts to reduce bleeding and extravasation after tubeless percutaneous nephrolithotomy (PCNL). In this study, Surgicel (oxidized cellulose) was used to seal the nephrostomy tract after totally tubeless PNL.**

***Patients and Methods*: Twenty patients with kidney calculi were treated with totally tubeless PNL. According to randomization, at the conclusion of surgery, the nephrostomy tracts were sealed with Surgicel in ten patients and left unsealed in the other ten. Postoperatively, the two groups were compared with respect to hematocrit changes and extravasation as detected by abdominal ultrasonography and wound-dressing inspection.**

***Results*: There was statistically significant decrease in the hematocrit in both the study ($P = 0.017$) and the control ($P = 0.003$) group. When the two groups were compared with respect to the decrease in hematocrit, no statistically significant difference was seen ($P = 0.241$). Similarly, extravasation from the nephrostomy tract was not significantly different in the two groups.**

***Conclusion*: Sealing the nephrostomy tract with Surgicel after totally tubeless PNL did not decrease bleeding or extravasation from the tract.**

INTRODUCTION

PERCUTANEOUS NEPHROLITHOTOMY (PCNL) has been used instead of open surgery for complicated and large kidney calculi in many centers.[1] Because of morbidities that nephrostomy tubes cause for patients postoperatively,[2] tubeless procedures in which the nephrostomy tube is removed at the end of the operation, have been tried.[3–5] Another novel attempt is totally tubeless PCNL, in which he ureteral stent is also removed immediately after the operation, and the safety of this stent-free PCNL has been proved.[6]

Complications of tubeless PCNL include bleeding and urinary extravasation from the nephrostomy tract. Recently, some surgeons sealed the tract with fibrin glue, gelatin matrix, or other material to reduce these complications.[7,8] Surgicel (oxidized cellulose) has been used for hemostasis in open surgery[9–11] and seems a good option for sealing the nephrostomy tract after tubeless PCNL. To our knowledge, Surgicel has not been used for this purpose previously.

PATIENTS AND METHODS

Patients admitted to our ward for PCNL from April to July of 2005 who met the inclusion criteria were enrolled in the study. Inclusion criteria were pelvicaliceal stones >2 cm, lower-calix stone >1 cm, or failure of shockwave lithotripsy. Exclusion criteria were bleeding disorders, obstruction distal to the stone, and small, scarified kidney. Patients whose ureteral stent remained after operation because of profuse bleeding also were excluded. Lower-caliceal access was used for all patients, and those who needed more than one access were excluded. History, physical examination, and routine laboratory tests (complete blood count, urinalysis, serum electrolytes, and coagulation tests) were performed. Kidney-ureter-bladder (KUB) radiography and kidney ultrasonography were done preoperatively for all patients. We used a 20-cm ruler with millimeter divisions to measure the stone size. The maximum diameter of the stone on the KUB film was the stone diameter. In the case of multiple stones, the sum of the maximum diameters of stones

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was considered the stone diameter. All patients signed an informed consent document.

Patients were randomized into study (with Surgicel) and control (without Surgicel) groups. In the study group, at the conclusion of surgery and before complete removal of the Amplatz sheath, Surgicel (Ethicone®) was placed in the nephrostomy tract under nephroscopy to fill the defect. After removal of Amplatz sheath and sealing of the tract, pressure dressing with multiple gauzes was done. In the control group, after removal of the Amplatz sheath, only pressure dressing was performed. An experienced surgeon (SMKA) performed all of the operations.

The hematocrit 2 days after the operation was measured as an indicator of bleeding. The number of wet gauzes in the wound dressing on day one and perirenal fluid collection detected by abdominal ultrasonography on day 2 were indicators of extravasation from the nephrostomy tract. All patients had follow-up visits 2 weeks after the operation.

Because this study was a pilot one, only 20 patients (11 men and 9 women), 10 in each group, were enrolled. Their median age was 36 years (range 20–68 years) and the median stone diameter 20 mm (range 10–45 mm). Seven patients (35%) had caliceal stones, ten (50%) had pelvic stones, and three (15%) had multiple pelvicaliceal stones. There was no difference between the study and control groups with respect to age, sex, stone size, or stone location (Table 1).

Data were analyzed by SPSS software (V. 11.5). The paired-samples *t*-test was used for comparing means before and after PCNL, and an independent-samples *t*-test was used for comparing mean differences between the study and control groups. Chi-square testing was used for qualitative independent variables.

RESULTS

The mean hematocrit values before and after PCNL in the total series of patients were, respectively, 44.4 ± 4.3% (SD) and 41.1 ± 4.4% ($P = 0.000$) (Table 2). In the control group, the mean hematocrit values before and after operation were 44.9 ± 5% and 40.8 ± 4.9% ($P = 0.003$). In the study group, the corresponding values were 43.9 ± 3.5% and 41.4% ± 4.2% ($P = 0.017$). However, there was no significant difference between the study and control groups with respect to decrease in hematocrit ($P = 0.241$).

In two patients from each group, there was mild urinary extravasation around the kidney, for which no intervention was needed. Also, three patients in each group had more than one wet gauze. Thus, respecting indicators of leakage from the nephrostomy tract, no significant differences were seen between the groups.

All the patients were discharged 2 days after their operation, and no one needed readmission, auxiliary procedures, or transfusion.

Table 1. Demographic and Stone Characteristics of Study and Control Groups

	Control group	*Study group*
No. pts.	10	10
Age (years)	33.5 (26–55)	50 (68–20)
M/F	5/5	6/4
Stone size (mm) (range)	20 (10–45)	20 (10–35)
Stone location (pelvis/calix/ both) (%)	4/4/2 (40/40/20)	6/3/1 (60/30/10)

Table 2. Hematocrit Changes and Extravasation in Study and Control Groups

	Control group	*Study group*
Hematocrit (%)		
Preoperative	44.9 ± 5	43.9 ± 3.5
Postoperative	40.8 ± 4.9	41.4 ± 4.2
Extravasation (ultrasonography) (%)	2 (20)	2 (20)
Extravasation (wet dressing) (%)	3 (30)	3 (30)

DISCUSSION

Percutaneous nephrolithotomy is a standard procedure for the treatment of large and complicated kidney calculi and is done instead of open stone surgery in many centers. As a nephrostomy tube after PCNL causes pain and distress for the patients,[2] many surgeons have tried to remove the tube at the conclusion of procedure (tubeless PCNL). Recently, sealants such as fibrin glue and gelatin matrix were used to prevent leakage and bleeding from nephrostomy tracts.[7,8] In this study, Surgicel (oxidized cellulose) was used to seal the tract after totally tubeless PCNL, and its effects on leakage and bleeding were studied.

The decreases in the hematocrit in the study, control, and total patients were significant, but comparing the change in the study and control groups, there was no statistically significant difference. Thus, sealing the tract with Surgicel had no effect on bleeding from the tract. No patient in the study or control group needed transfusion. Use of Surgicel had no effect on treatment processes and outcomes. Also, the two groups had no statistically significant difference in extravasation according to wet dressing and sonographically detected perirenal fluid. No patient needed intervention for extravasation, and again, Surgicel usage had no effect on treatment processes and outcomes.

The patients in the control group were younger than those in the study group. However, this was not statistically significant, and it seems unlikely that age could affect the amount of leakage and bleeding from a nephrostomy tract to a great degree. Also, other independent variables were not significantly different in the two groups.

Noller and associates[7] sealed nephrostomy tracts after tubeless PNL in 10 renal units with fibrin glue (Hemaseel APR), and the patients were assessed respecting decrease in hematocrit and urinary extravasation. Those investigators found no statistically significant difference for decrease in hematocrit 1 day after operation, and CT scans and dressings revealed no urinary extravasation. The investigators concluded that the use of fibrin glue was safe and feasible. In this study no control group was available.

Lee and colleagues[8] used gelatin matrix to seal the nephrostomy tract in two patients who had undergone tubeless PCNL, and hemoglobin and extravasation on CT scan were assessed postoperatively. Because hemoglobin was stable and there were no signs of bleeding and obstruction, those authors concluded that gelatin matrix usage might have a role in preventing post-PCNL bleeding. This study was small, and there was no control group.

Surgicel (oxidized cellulose) has been used for hemostasis for a long time, and its safety and efficacy have been proved. It is less expensive than other sealants, and its use is easier. Thus, we assessed its ability to decrease bleeding and urinary leakage after totally tubeless PCNL. Although Surgicel had no effect, we recommend repeating the study with a larger sample, more precise imaging such as CT scans, and longer follow-up. Also, the role of other sealants alone or with Surgicel in tubeless PCNL must be studied.

REFERENCES

1. Lingeman JE, Lifshitz DA, Evan AP. Surgical management of urinary lithiasis. In: Walsh PC, Retik AB, Vaughan ED Jr, Wein AJ (eds): Campbell's Urology, ed 8. Philadelphia: WB Saunders, 2002, pp 3361–3451.
2. Pietrow PK, Auge BK, Lassas CD, et al. Pain after percutaneous nephrolithotomy: Impact of nephrostomy tube size. J Endourol 2003;17:411–414.
3. Bellman GC, Davidoff R, Candela J, et al. Tubeless percutaneous renal surgery. J Urol 1997;157:1578–1582.
4. Limb J, Bellman GC. Tubeless percutaneous renal surgery: Review of the first 112 patients. Urology 2002;59:527–531.
5. Lojanapiwat B, Soonthornphan S, Wudhikarn S. Tubeless percutaneous nephrolithotomy in selected patients. J Endourol 2001; 15:711–713.
6. Aghamir SM, Hosseini SR, Gooran S. Totally tubeless percutaneous nephrolithotomy. J Endourol 2004;18:647–648.
7. Noller MW, Baughman SM, Morey AF, et al. Fibrin sealant enables tubeless percutaneous stone surgery. J Urol 2004;172:166–169.
8. Lee DI, Uribe C, Eichel L, et al. Sealing percutaneous nephrolithotomy tracts with gelatin matrix hemostatic sealant: Initial clinical use. J Urol 2004;171:575–578.
9. Sharma JB, Malhotra M. Topical oxidized cellulose for tubal hemorrhage hemostasis during laparoscopic sterilization. Int J Gynaecol Obstet 2003;82:221–222.
10. Rastogi V, Dy V. Control of port-site bleeding from smaller incisions after laparoscopic cholecystectomy surgery: A new, innovative, and easier technique. Surg Laparosc Endosc Perc Techn 2002;12:224–226.
11. Bhatnagar RK, Berry S. Selective Surgicel packing for the treatment of posterior epistaxis. ENT J 2004;83:633–634.

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EDITORIAL COMMENT

There are two important questions surrounding the refinement of the tubeless procedure: (1) Is drainage necessary? If so, for how long, and what is the best method? (2) Does instillation of hemostatic agents into the tract truly minimize bleeding?

It is now more than 10 years since we performed our first tubeless percutaneous procedure. Prior to embarking on this, our search of the literature found a few case reports of totally tubeless procedures that resulted in complications such as urinary extravasation, fever, and pain. It became clear that it is imperative to provide adequate urinary drainage after a procedure. What was discovered is that the flank is, with few exceptions, dry after a tubeless procedure with no urinary extravasation, a point first made by Wickham in the 1970s but never widely appreciated. When we placed stents with tails out the urethra, some patients accidentally pulled their stents out early. These patients who unintentionally wound up with a totally tubeless procedure suffered morbidity. Many of them needed to have their stents replaced, and those who did not have replacement suffered prolonged recovery with pain and leakage out the flank. The intent of the tubeless procedure was to decrease the morbidity, and I believe the totally tubeless approach has been tested and shown to be ill advised.

In this current study, 20% of the patients in each group had urinary extravasation, and 30% had more than one wet gauze dressing. The stent averts these complications and can be left in for a short period without the requirement for cystoscopy. We are currently leaving double-J stents for 3 to 5 days after a tubeless procedure with the tail out the flank. Thus, simply pulling the tail will easily remove the stent, obviating cystoscopy (unpublished data).

With regard to instillation of product into the flank, I do not think the attempt should be made to seal the tract. My feeling is that certain patients can benefit from the instillation of a hemostatic agent such as FloSeal. Most patients have minimal bleeding after a tubeless procedure, and the FloSeal is likely unnecessary. It is yet to be shown whether FloSeal will minimize bleeding in those patients who have significant hemorrhage. I currently instill FloSeal in the tract in those patients who have persistent bleeding even after pressure is applied to the flank. I simply instill the product in the tract after removal of the working sheath. Although Clayman's technique of using a balloon is quite elegant, I have not had any complications from FloSeal seeping into the collecting system. I think if you are inclined to place some hemostatic agent in the tract, FloSeal is preferable to Surgicel.

In conclusion, I applaud the authors for their efforts. However, I do not see a role for totally tubeless procedures in my practice. Randomized trials will let us know whether the instillation of hemostatic agents in the tract will make a significant difference in bleeding.

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1. Zeph Okeke , Sero Andonian , Arun Srinivasan , Edan Shapiro , Brian A. Vanderbrink , Louis R. Kavoussi , Arthur D. Smith . 2009. Cryotherapy of the Nephrostomy Tract: A Novel Technique to Decrease the Risk of Hemorrhage After Tubeless Percutaneous Renal SurgeryCryotherapy of the Nephrostomy Tract: A Novel Technique to Decrease the Risk of Hemorrhage After Tubeless Percutaneous Renal Surgery. *Journal of Endourology* **23**:3, 417-420. [Abstract] [PDF] [PDF Plus]
2. Mustafa Okan Istanbulluoglu, Bulent Ozturk, Murat Gonen, Tufan Cıcek, Hakan Ozkardes. 2009. Effectiveness of totally tubeless percutaneous nephrolithotomy in selected patients: a prospective randomized study. *International Urology and Nephrology* . [CrossRef]
3. 2009. Survey of EndourologySurvey of Endourology. *Journal of Endourology* **23**:2, 209-222. [Citation] [PDF] [PDF Plus]
4. Iqbal Singh , Ram N. Saran , Manish Jain . 2008. Does Sealing of the Tract with Absorbable Gelatin (Spongostan®) Facilitate Tubeless PCNL? A Prospective StudyDoes Sealing of the Tract with Absorbable Gelatin (Spongostan®) Facilitate Tubeless PCNL? A Prospective Study. *Journal of Endourology* **22**:11, 2485-2494. [Abstract] [PDF] [PDF Plus]
5. Tawfik H. Al-Ba'adani, Khaled M. Al-Kohlany, Abdulelah Al-Adimi, Mansour Al-Towaity, Taher Al-Baadani, Mohammed Alwan, Mohammed Al-Hussieni, Shehab Al-Germozi, Mokhtar Al-Masani, Khalid Al-Badwy, Ibrahiem H. El-Nono. 2008. Tubeless percutaneous neprolithotomy: the new gold standard. *International Urology and Nephrology* **40**:3, 603-608. [CrossRef]
6. David Canes, Mihir M Desai. 2008. New technology in the treatment of nephrolithiasis. *Current Opinion in Urology* **18**:2, 235-240. [CrossRef]
7. Pascal Mouracade , Romain Spie , Herve Lang , Didier Jacqmin , Christian Saussine . 2008. Tubeless Percutaneous Nephrolithotomy: What about Replacing the Double-J Stent with a Ureteral Catheter?Tubeless Percutaneous Nephrolithotomy: What about Replacing the Double-J Stent with a Ureteral Catheter?. *Journal of Endourology* **22**:2, 273-276. [Abstract] [PDF] [PDF Plus]
8. Tim J. Crook , C.R. Lockyer , Stephen R Keoghane , Byron H. Walmsley . 2008. Totally Tubeless Percutaneous NephrolithotomyTotally Tubeless Percutaneous Nephrolithotomy. *Journal of Endourology* **22**:2, 267-272. [Abstract] [PDF] [PDF Plus]
9. Keith L Lee, Marshall L Stoller. 2007. Minimizing and managing bleeding after percutaneous nephrolithotomy. *Current Opinion in Urology* **17**:2, 120???124. [CrossRef]